Breakout Session # 23: CAV Early Deployment Alternatives

Summary of Key Findings and Lessons Learned

FHWA CAV Research Results and Next Steps to Deployment

• Cooperative Adaptive Cruise Control – Light Vehicle Platooning (longitudinal control)
  • Proven concept feasibility
  • Single OEM platform
  • Next steps: platoon stability, performance character, light/heavy vehicle stream, infrastructure

• Signalized Intersection Approach and Departure - GlidePath
  • Single vehicle, single intersection
  • 7% fuel improvement manually, 22% fuel savings
  • Next steps: two vehicles, two intersections

• Speed Harmonization
  • Modeling streams of vehicles receiving speed control recommendations from TMC
  • Reduce congestion and potential to double vehicle capacity
  • Next steps: system-wide benefits from CAV at various deployment scales
Recommended Action Items

• Begin to address real-world deployment issues

• CACC – Light Vehicle Platooning (longitudinal control)
  • Ingress/Egress merging; infrastructure impact/premature damage
  • Optimum size of platoon; gap/headways; optimum vehicle performance criteria to engage; handshake
  • Early transition using managed lanes; Dedicated lane? Left side? Right Side?
  • Lane change issues: visibility limitations of lead vehicle

• Signalized Intersection Approach and Departure - GlidePath
  • Mixed Traffic impacts
  • Connected and non-connected vehicles in stream
  • Vehicle performance characteristics in algorithm for each vehicle

• Speed Harmonization
  • Operating agency engagement early in field testing
  • Benefits that justify investment

• Cybersecurity
  • Infrastructure vulnerability; vulnerable vectors into vehicle as messages/requests go to vehicle
  • Federal DOT Role unclear
Urban Form and Automated Flows

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Who are Vulnerable Road Users?

- Pedestrians
- Cyclists
- Motor-Cyclists
- Children
- Elderly
- People with health impairments or disabilities

Attributes:
- Difference in Speed
- Unprotected
- Task Capability
A significant contributor to vulnerability of ‘Unprotected Road User’ is Street Design.
Walking-Horsecar
1800-1890

Electric Streetcar
1890-1920

Recreational Automobile
1920-45

Freeway
1945-Present

Since the advent of cars, streets have been designed for speed, to help cars go as fast as possible.
Architects, planners, futurists propounded visions of a future city based on fast and efficient mobility made possible by the automobile.
Cities were laid out based on urban design measures to accommodate cars.

Hierarchy in road types
Pedestrians separated from cars
Extensive use of cul-de-sacs

Super-blocks

Source: https://es.slideshare.net/frgsanchez/superblocks-36074038 (left)
https://ntl.bts.gov/DOCS/GL.html (right)
Often, visions translate to reality. But did these visions take into account the needs of ALL potential users?
Automated vehicles claim to benefit Vulnerable Road Users significantly.

- More Accessibility
  - For people with disabilities
  - For aging population
  - Children

- More Productivity
  - Efficient use of in-vehicle time
  - Door to door connectivity
  - No more parking hassles
  - Fewer crashes
  - Mobility for ped. & cyclists
  - Fuel savings
  - E-mobility
  - Less congestion

- Increased Safety
  - Smaller ROW
  - Smaller headways
  - Fewer Signages
  - Infill potential

- Environment friendly
  - Efficient use of Space

- Efficient use of Space
Imagine a future where the road belongs to all, equally.
But does it belong to all, equally?
A viable AV mobility system requires some kind of segregation from ‘non-automated’ users of the road.
Segregation by mode can be incorporated in street and network design in many ways. This is the most common.
Concept of a future town centre in Singapore with autonomous Vehicles. (Source: Ministry of Transport)
Would you prefer to walk here?
Livability (Safety, health, comfort, privacy)
Equal Access to opportunity
Community and public life
Joy!
In order to maximize efficiency/safety/ viability of one mobility system, other mobility systems may be compromised.

How can AV deployment enhance walking and cycling experience, rather than limiting it?
Urban Design

Measures for Walkability

- Sidewalk Width
- Surface type
- Streetscape
- Street width
- Vegetation
- Car Traffic
  - Volume
  - Speed
  - Traffic Control Devices
- No. of people
- Continuity
- Ease of crossing and crossing aids at intersections
- Distance between two intersections
- Access points from street

Source: Michael van Eggermond
Singapore HDB Town structure

Source: [https://ntl.bts.gov/DOCS/GL.html](https://ntl.bts.gov/DOCS/GL.html) (left)
Next Steps

**TAXI AND RIDEHARING MODEL**
Vehicle Size = 4-6 Persons

**GOVERNMENT REGULATED FLEET MODEL**
Vehicle Size = 20 - 60 Persons

**PERSONAL OWNERSHIP MODEL**
Vehicle Size = 4-6 Persons

**RESTRICTED USE MODEL**
Vehicle Size = 2-20 Persons